

ROLE OF LEAN MANUFACTURING LEADERSHIP ON TECHNOLOGY TRANSFER IN INDIA: A FACET OF MANUFACTURING INDUSTRIES WITH REFERENCE TO GUNTUR DISTRICT, ANDHRA PRADESH

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ABSTRACT

Globalization is a phenomenon for technology transfer among different countries. Technology is an embodied of backbone for national growth. Technology advancement and its effective results impact directly on the economic development. Technology transfer is the flow of knowledge or process of technology from one country to another country. It includes the flow of skills, values, organization, and capital from the point of generation to the site of adaptation and application. In today's modern era businesses were being keen on profitable exploitation through the appropriate technology transfer. Lean leadership can be considered as a way of sustaining and improving the employee performance in lean production systems. The present study focuses on the principles of lean leadership and the practices that can lead to improving the employee performance. Global competitiveness drives the organization for technology transfer as a reliable source for noteworthy upshot and making a profit out of it. The headway of technology transfer in the manufacturing sector in India has been magnifying with the potential prerequisite. The industries in India are upgrading with technology transfer in order to sustain in the market with the competitive edge. This study identifies the variables that affect the technology transfer and acts as a control measure in the implementation of the successful technology transfer. Finally, through the analysis, the study proved that the adequate transfer of technology increases the productivity of the organization.

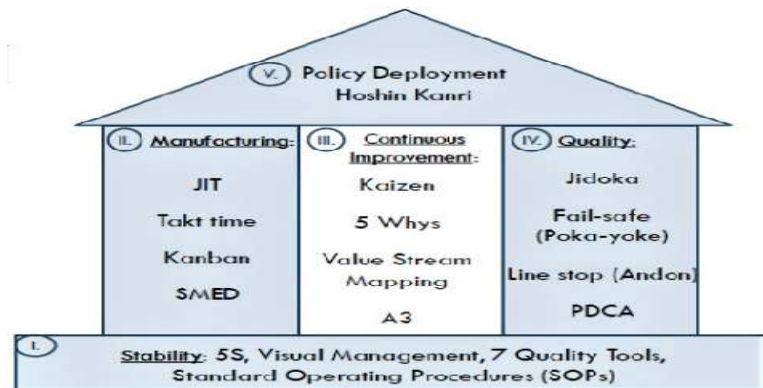
KEYWORDS: Technology Transfer, Lean Leadership, Manufacturing Industry, Guntur district, Distributed Leadership Style, Transformational Leadership, Transactional Leadership, Organisation & Performance

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INTRODUCTION

According to Womack J, Jones D, Roos D (1990), Lean has become a common word and it is found almost everywhere like lean services, lean entrepreneurship, lean software development, lean product development, lean accounting, lean startups and the list goes on and on. The main concept is maximizing the customer value with minimum waste, i.e. "manufacturing/delivering more with less". There is a house of lean where lean transformation

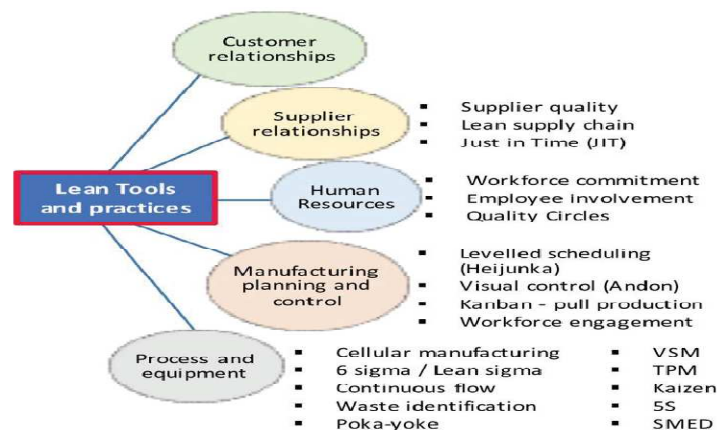
is about the whole organization but not only production. The framework of the lean management is given below.



Source: House of Lean Jones DT, Womack J. (1996)

Figure 1: Figure Shows the “House of Lean”

Lean manufacturing relies on several factors, Hamid RA (2011), identified eight internal organizational factors and two external factors. The internal factors include “top management”, “training and education”, “thinking development”, “employees”, “working culture”, “communication”, “resources” and “business planning”. The external factors include “customer focuses and “government intervention”.



Source: Lean Tools and Practices”, Salonitis K, Tsinoopoulos C(2016)

Figure 2: Figure Shows the Lean Tools and Practices

The leadership role is critical in the introduction and implementation of lean. One of the first studies on the role of the leader in lean was provided by Mann, D (2009), he structured the role of leadership as a process, proposing the dimensions of lean leadership. A number of attributes were identified for a leader to be able to guide the organization through the lean journey. The lean leadership has many principles such as:

- Improvement culture
 - Self-development
 - Qualification.
 - 4. Gemba
 - 5. Hoshankanri
- } (Policy development)

The concentrated leadership style in the study is distributed, transformational and transactional styles. Van Dun et al., (2016), said that both transformation and transactional leadership behaviors are expected from lean leaders. Transactional leaders tend to focus on the efficient use of resources (following the lean idea of eliminating waste), whereas transformational. McMahon (2014) suggests that leadership needs to be “firm and inspiring, relentless and resilient, demanding and forgiving, focused and flexible”. With regards the leaders themselves, the expectation is for them to act as role models.

Technology is an important ingredient of the development mix and an important aspect of the international economic issue is the technological gap. Technology transfer is the term used to describe the processes by which technological knowledge moves within or between organizations. Channels for the flow of technology are foreign direct investment, reverse engineering, non-commercial channels. The use of technology has been increased due to its benefit which includes the increase in efficiency of the organization which results in long-term benefits to the organization.

Technology transfer can be done in two ways, i.e. either horizontal or vertical.

Horizontal technology transfer: In horizontal transfer, a technology that is already being used at one place is transferred/ applied or adapted as it is at a different location (proven international technology transfers between company-company, and country-country, through FDI/Joint Ventures/Licensing). Vertical technology transfer: A vertical transfer represents a flow of knowledge from laboratory research through developmental stages and ultimately to commercialization. In relation to this, the implementation process of lean is given below.

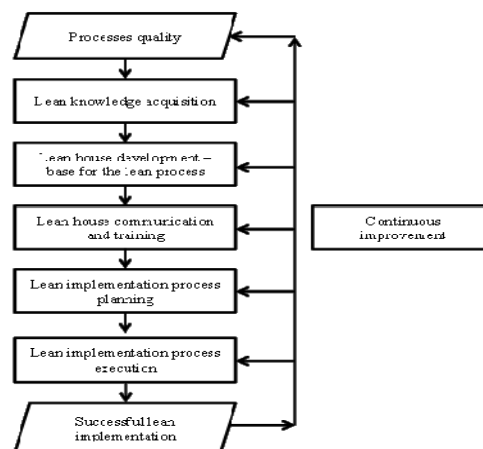


Figure 3: Figure Shows the “Lean Implementation Process”

This lean implementation is a continuing process of dealing with quality, training, planning, execution, and implementation and the outcome of this process is continued improvement.

REVIEW OF LITERATURE

According to Elliott, 2008 lean lives and dies by leadership. Womack and Jones (1996) stressed five lean principles which form a sequence of implementation. (1) Specify what does and does not create value from the customer’s perspective; (2) identify all the steps necessary to design, order and produce the product across the whole value stream to highlight non-value-adding waste; (3) make those actions that create value flow without interruption, detours, backflows, waiting or scrap; (4) only make what is pulled by the customers just-in-time; (5) strive for perfection by continually removing successive layers of waste as they are uncovered. Karlsson and Ahlstrom (1996) identified seven design

elements of the lean production system; elimination of waste, continuous improvement, multifunctional teams, zero defects/JIT, vertical information systems, decentralized responsibilities/Integrated functions and pull instead of push. According to Manoj Pant and Sangeeta Mondal (2010), technology transfer and spill over is dependent on the absorptive capacity of the firms. The government has an important enabling role in determining technology transfer to the local firm. This study finds that institutional factors like the degree of competition positively impact the effects of traditional factors like absorptive capacity in determining technology transfer. P. SrinivasSubbarao (2008) said that the ability to develop countries to use technology transfers to develop their domestic capabilities, allowing such countries to reap the social and economic benefits of existing technologies, have been very mixed.

Achanga et al. (2006) investigate critical success factors for lean implementation and find four such factors, one of which they label leadership and management. The authors state that “in order to succinctly implement the concept of lean manufacturing successfully the recipient companies should harbor strong leadership traits capable of exhibiting excellent project management styles.” Leadership in the day to day operations is something different than senior leaders acting as role models. Lean leadership can be understood, in, and analyzed by using different contexts in the leadership literature. This study chose to focus on two authentic leadership which are: development of transformational leadership and shared or team leadership. Team leadership is central for lean. Multifunctional teams with responsibilities for constantly improving the way they perform tasks require team leadership. Whoever has the experience, capability and/or improvement idea takes the lead. This type of shared leadership for lean is one of the means to realize active participation by and the utilization of the capabilities of all employees. Dombrowski and Mielke suggest a new definition of lean leadership: “Lean leadership is a methodical system for the sustainable implementation and continuous improvement of the Lean Production System (LPS). This includes the customer focus of all processes as well as the long-term development of employees and leaders.

Research Problem

Inadequacy exists in technology transfer of the manufacturing sector in India. It is difficult to determine prominent variables that affect the technology transfer either during or subsequent of technology transfer. Because of inadequate technology transfers the productivity and profitability of the industries declined. In order to identify the rationale for inadequacy, different dimensions of factors affect the technology transfer has to be probed

Objectives of the Study

- To analyze the factors affecting the technology transfer in the manufacturing sector.
- To suggest the improved ways to fulfill the gap in the technology transfer process in the manufacturing sector in India.

Hypothesis

H1: Adequate technology transfer can increase the productivity of an organization.

RESEARCH METHODOLOGY

The data collection for this study was done basically through the questionnaire. Study is targeted a population of 20 manufacturing units and distributed the questionnaires and get the data from them. The total respondents involved in technology transferred are 41. The geographical area of the study is on the manufacturing units in Guntur district.

The sampling technique is a random sampling.

DATA ANALYSIS

The data have been collected with the help of a questionnaire. And it has been analyzed and interpreted with the help of tables with relevant descriptions. Appropriate treatment has been done to the raw data and logical conclusions are drawn based on the findings. The questionnaire consists of 25 questions where 5 questions relate to company name and their designation and name and age and gender. The next 20 questions were based on their perspective on the adequate technology transfer and also their effect on the variables which resembles in the growth of the organization.

Table1: Table Shows the Correlation between the Degree of Technology Transfer and the Increase in The Productivity Level

Correlations			
		What is the degree of Technology transfer occurred in your organization	What is level of increase in productivity
What is the degree of Technology transfer occurred in your organization	Pearson Correlation	1	.633**
	Sig. (2-tailed)		.000
	N	41	41
What is level of increase in productivity	Pearson Correlation	.633**	1
	Sig. (2-tailed)	.000	
	N	41	41
**. Correlation is significant at the 0.01 level (2-tailed).			

The above table specifies that there is a positive relationship between the degree of technology transfer and the increase in the productivity level, which says that company which is having a high degree of technology transfer will have the high in the increase in productivity level. The companies which have been surveyed were mostly in perspective of where technology transfer increases the productivity level.

Table 2: Table Shows the Prior Knowledge Requires for Technology Transfer

How Much Prior Knowledge Requires for Technology Transfer Takes Place					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	2	4.9	4.9	4.9
	Neutral	17	41.5	41.5	46.3
	High	17	41.5	41.5	87.8
	Very High	5	12.2	12.2	100.0
	Total	41	100.0	100.0	

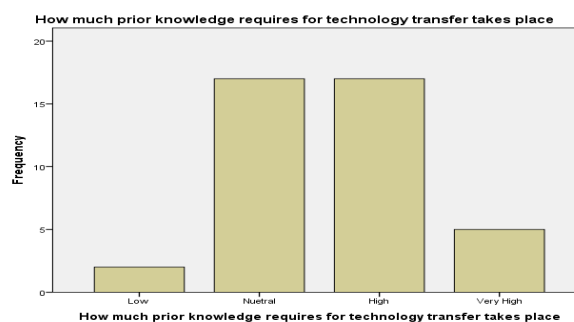


Figure3: Figure Shows the Prior Knowledge requires for Technology Transfer

The above table and figure specify that prior knowledge which required in order to adopting the technology is high. If the prior knowledge is high, the absorption capacity will be higher. The prior knowledge required was also neutral in some companies it can say that low-level employees consider, prior knowledge is not needed for the technology transfer.

Table 3: Table Shows the Degree of Technology Transfer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	5	12.2	12.2	12.2
	Neutral	15	36.6	36.6	48.8
	High	14	34.1	34.1	82.9
	Very High	7	17.1	17.1	100.0
	Total	41	100.0	100.0	

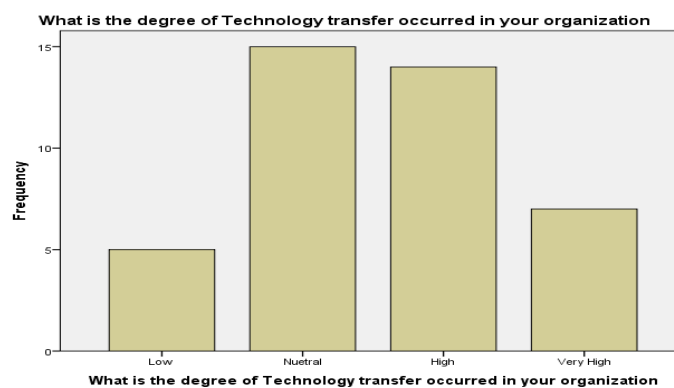


Figure 4: Figure Shows the Degree of Technology Transfer

The above table and figure specify that the degree of technology transfer occurs in the organization data from the respondents revealed that, 36.6 percent were neutral and 34percent were high which specifies that technology transfer is less in medium and small scale industries and high in large-scale industries.

H1: Adequate technology transfer can increase the productivity of an organization.

The statistical model of regression analysis is used. It establishes the relationship between dependent and independent variable's. It focuses on the relationship between a dependent variable and one or more independent variables.

The table below shows that the independent variables of adequate technology transfer will affect 65% on the level of increase in the productivity of an organization which deliberately suggest that organization emphasize on the predominate variables which give vigorous benefits to the organization. It indicates that change in independent variables will have a change in 65 % of the dependent variable that is productivity of an organization.

Table 4: Model Summary Table Shows the Effect of Independent Variables on Increase in Productivity.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.806 ^a	.650	.500	.50598	.650	4.335	12	28	.001

The table below specifies that the p-value is 0.01 which represents the adequacy of technology transfer can affect the productivity level where it is significantly affects the independent variables of the adequacy of technology on the dependent variable productivity of an organization. So, the hypothesis can be accepted.

Table 5: Table Shows the Significance Level of the Analysis

ANOVA ^a						
	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13.319	12	1.110	4.335	.001 ^b
	Residual	7.168	28	.256		
	Total	20.488	40			

The below table specifies that with the increase in the respective independent variable with one unit level then the dependent variable is significantly affected. It measures the dependent variable with the change in the independent variable by keeping remaining variables constant. In this table, it can say that the time, cost, skills, level of relationship between the technology receiver and technology supplier was positively affected the dependent variable that is the productivity level of the organization.

Table 6: Beta Table Shows the Productivity Variable

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.073	.535		2.007	.054
What is the level of cost of technology transfer	.061	.179	.075	.339	.737
How much time does change in culture takes place	-.286	.179	-.331	-1.598	.121
How much prior knowledge requires for technology transfer takes place	-.035	.175	-.037	-.198	.845
What is the level of access of technical and financial information required for technology transfer takes place	.279	.148	.329	1.887	.069
How much importance does your organization give to the infrastructure	-.181	.197	-.257	-.917	.367
How much importance does your organization give for assessing and analyzing characteristics of their organization	-.247	.190	-.320	-1.298	.205
How much time does organization takes place for technology transfer	.044	.168	.064	.264	.794
What should be the level of the relationship between technology recipient and suppliers	.184	.269	.215	.684	.500
What should be the level of skills, knowledge of the human resources	.072	.184	.093	.395	.696
What should the level of control of implementation	-.015	.206	-.018	-.071	.944
What is the degree of Technology transfer occurred in your organization	.420	.196	.542	2.149	.040
What is the level of utilization of technology by your organization	.429	.254	.512	1.689	.102

With the r square value of 65% and the p-value is 0.01 which represents that the change in the independent variables of adequacy technology transfer has the significant effect which is < 0.05 on the value of the dependent variable that is the increase in the productivity level of an organization when a technology transfer takes place. This result specifies that the hypothesis: adequate technology transfer can increase the productivity of an organization, can be accepted.

CONCLUSIONS

In this article it is argued that, the concern about the transfer of technology in India of manufacturing industries in Guntur district and it is found that, the lean manufacturing leadership principles and how it affects the manufacturing. The level of utilization of technology by the industries has been known and its effect on the growth of the industry. Most of the industries consider the variables discussed for the successful transfer of technology. These companies measure the dependency of these variables on the growth of the organization where it leads to the long-term benefits. The growth includes the profits and customer base. In order to sustain companies has been adopting technology transfer on the competitive edge. It is clear that from this article, **Transformational and transactional leadership styles play a major role in ruling the lean leadership.**

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